Do Low Phytoplankton Growth Rates Signal the “Bad” Habitat Conditions in Susiun Bay Driving the Pelagic Organism Decline

#0065

Technical Panel Review

Proposal Name: Do Low Phytoplankton Growth Rates Signal the “Bad” Habitat Conditions in Susiun Bay Driving the Pelagic Organism Decline

Applicant Organization: San Francisco State University

Principal Lead Investigator(s):
Dugdale, Richard
Wilkerson, Frances

Amount Requested: $605,751

TSP Panel Summary of Findings:

In all likelihood the proposed studies will yield invaluable information on Suisun Bay, but probably will not identify all of the key “bad” factor(s) that contribute to its demise. The research team has a good track record and good preliminary data exist that indicate phytoplankton growth rates signal bad habitats within the Bay, but other factors almost surely will arise as the result of further research. For example, their work will not deal with pesticide effects on phytoplankton productivity, or the relative importance of heterotrophy versus autotrophy suppression/switching.

The reviews (external) of the proposal identified similar concerns yet differed in their ranking. The rankings were: superior, above average and sufficient. Those concerns include that the “mesocosms” are really not large confined enclosures but rather more routine 20 L containers; the Corbula hypothesis is somewhat weak; the modeling is loosely defined. One of the external reviewers was willing to look past these shortcomings in deference to the world−class reputation of the research team while another was not so swayed by the makeup of the research group.

Questions: Are the researchers going to advance understanding of the negative factors influencing phytoplankton in Suisun Bay? It is unlikely that the conditions that suppress growth the of plankton in Suisun will be completely determined.

Relevance to PSP Topic Areas:

High

TSP Technical Rating:
Above Average

TSP Funding Recommendation:
Fund w/conditions

TSP Amount Recommended: $**500,000**

Conditions:

1. The panel recommends reducing the amount requested to limit the overall cost of the project with little change to the proposed scope of work or products. 2. The applicant is encouraged to make an effort to address spatial heterogeneity rather than assuming homogeneity.

External Technical Review #1

Proposal Title: Do Low Phytoplankton Growth Rates Signal the “Bad” Habitat Conditions in Susiun Bay Driving the Pelagic Organism Decline

Proposal Number: 0065

Proposal Applicant: San Francisco State University

Purpose

Comments	**In some respects this is a model proposal for a highly task-oriented agency. The brief but concise statement of problem is followed immediately by the questions and hypotheses, which are directly applicable and very appropriate. Recent observations in Suisin Bay have prompted this offer of further study, and it IS important. The documented existence of interannual variability demands further elaboration of the "bad water" concept in Suisin Bay, and it is intriguing. The study paves the way for an implementation project if results are consistent with previous work (i.e., was interannual variability a fluke or a new reality? The results of this study will conclusively indentify a serious issue or not. The product is not designed to provide either methodology or approach developments, but rather to elaborate on an important question that demands repeated demonstration.**
Rating	**Superior**

Background

Comments	**The modeling component is the weakest part of the proposal, though the components of the system being studied are also among the more difficult TO model. It is not clear to me that a successful model of this part of the system could yet be composed because of the large number of highly variable input terms. It is also not clear that a model is necessary to accomplish the provision of high value to the estuary study. The**

	described, seemingly simplistic model, will in theory be able to reproduce the collected results and estimate their recurrence under similar circumstances. It relies upon certain assumptions of water quality consistency that I am not convinced are PROVEN to be valid (see Approach below). Although they say that the model, completely undescribed in modern application, will "predict the changes in primary production in Suisin Bay with changes in whatever proves to be the problem...." I see no actual manipulation other than dilution with source or sink water that could approach this question. It is possible that another group, known to them, and CalFed, but not to me is investigating what the "bad" of "bad water" IS. In all honesty, it is likely that a good model would be approachable AFTER this round of work.
Rating	**Sufficient**

Approach

Comments	**I admire the basic concept of the project, in that so-called physiological indicators are both more sensitive and more meaningful than gross ecosystem parameters alone. I like the combination of "bioassay" rate measurements in conjunction with standing crop/resource analyses. Cubitainer experiments are not in my view "mesocosms". That term brings to my mind the several cubic meter enclosures (not bottles) run by Delaware and North Carolina institutions among others. Carboys have so many physical limitations that their results are truly container bioassays. I would never use the term enclosures for these experiements, yet for the issue at hand they hold significant value (as has been demonstrated in I guess the last funding period).** **There is a potentially serious issue with the assumptions related to the very important variable of light availability. According to the proposal, the light field will be assessed by Secchi transparency using an equation published by Cloern in 1990, more**

	than 15 years ago. That may be fine for a nearly time−invariant habitat (if such a thing exists anymore) like the North Central Pacific Ocean, but seems very dangerous in a highly−manipulated and managed system like the San Francisco Bay Estuary. First, there is no Cloern 1990. The actaul paper containing the relationship is from 1991 and is not cited. However, the relationship in that paper assumes a very high attenuation by non−particulate material and breaks down completely at high transparency. According to the recent data, this may be moving into the realm of possibility. I am not convinced that the same optical characteristics of the particle−free water hold now that so many land−use changes have taken place. Personally, I'd measure light extiction directly, because it is a MAJOR variable in interpretation of the system dynamics. **While I love the repeated use of the term "Bad water" and am convinced of its existence, I am completely surprised that there is no effort whatsoever to identify any potential source of the problem. Dilution with source and receiving waters may identify that a local problem EXISTS, but no bioassays of runoff, stream inputs, benthic porewater or atmospheric source materials is proposed.** **On the other fronts (management, dissemination, contribution) this study appears to be effective. The PI is hopefully doing this as a retirement hobby and few could stand in his shoes in this respect. Oceanographers are priveledged to be among the few professionals who only get better as they get older (unless they intellectually retired right after graduate school), and Dugdale has the big−picture vision to provide exquisite oversight. The group is especially productive in dissemination.**
Rating	**Above Average**

Feasibility

Comments	There is little to say here. The previous data, as presented, provide confidence that the scope and quality of the work are appropriate. The proposed work is not at all technologically challenging, so the likelihood of success is very high. It certainly is a doable body of work, and meets significant needs of the larger project goals.
Rating	Superior

Budget

Comments	It is all salaries (71%) for people to do work they know how to do well. The actual costs of implementation are minor. Anyone in our business would LOVE to get this kind of support. For a project of this magnitude, PIs dedicating 3–4 months of time per year is justifiable, necessary, and undoubtedly also adequate to accomplish the mission.
Rating	Above Average

Relevance To CALFED

Comments	The proposed work touches on almost all of the topics but is strongly aimed at three of them: Environmental Water; Response to Changing Environment; and Habitat Availability / Response to Change. In its approach it involves priority issues including temporal synthesis, interface with existing data and research activites, and to a limited extent modeling. Because of its focus on the base of the food web as affected by an presently unknown major stressor, it is of ultimate utility to CalFed managers and policy makers. I just wish they would do a little more for this much money to identify, through bioassays, some potential sources of the "Bad water", which would REALLY help.
Rating	Superior

Qualifications

Comments	The three top dogs are all highly respected nationally, internationally, and by the reviewer. They have unusually high productivity, and are truly nice people as well. I know them all, have cruised with some, and am an admirer without doubt. As with many in their positions, it is my belief that they pulled back on promises but are all the more likely to provide more than was asked. Because the actual logistical details are trivial to anyone making such a living off this kind of research, the infrastructure for the entire project is well emplaced.
Rating	Superior

Overall Evaluation Summary Rating

Comments	This is a fine proposal. With the exception of the two issues (light field assumptions and lack of investigation into sources of "bad water") discussed and a serious level of typographical and grammatical error in the text, the proposed work suits the target agency and topics of concern "to a T". The combination of rate measurement and bulk constituent analysis is appropriate and rarely offered for Task-oriented projects. The team is first-rate. The likelihood of success and the relevance to needs is high. I wish someone in our area cared as much about OUR environment and that such skilled investigators would come to THEIR aid.
Rating	Superior

External Technical Review #2

Proposal Title: Do Low Phytoplankton Growth Rates Signal the “Bad” Habitat Conditions in Susiun Bay Driving the Pelagic Organism Decline

Proposal Number: 0065

Proposal Applicant: San Francisco State University

Purpose

Comments	**The goals, objectives and hypotheses are clearly stated; the idea is quite timely, and I believe it is important for understanding the ecology of the SF Estuary in general. The proposed scale is also appropriate. I think that the proposed assessment of phytoplankton communities, nutrient sampling, and particularly the mesocosm studies, have direct utility for understanding the role of potentially ‘bad’ Suisan Bay water compared to neighboring bays for affecting phytoplankton composition. However, I have a few issues with the proposal. First, a central rationale for the study is the NH4 (bad) is related to reduced pp biomass (combined with other factors, such as turbulence etc.) and by comparison, NO3 (good) fuels desirable pp, here broadly defined as diatoms (do toxic Pseudo−nitzschia ever appear in the estuary? They like nitrate…). Yet, they focus on ‘larger’ phytos (diatoms, ignoring dinos) and are not assessing the autotrophic contribution of smaller phytoplankton (pico− sized, e.g.) that may be associated with NH4 – the authors do propose to measure the < 5 mm chl contribution, which will be a proxy of such biomass, but it would be quite simple to determine the autotrophic v. heterotrophic component of smaller phytoplankton and bacterioplankton, and I’m surprised that they didn’t address this. I realize that they would like to focus on ‘larger’ phytoplankton, but they will miss out on the details of what phytoplankton (presumably smaller) might be associated**

	with NH4 contribution. I do not suggest that they do an intensive and detailed assessment of the microbial community – that is clearly beyond the scope of this proposal, but I would like to see them at least address these smaller phytoplankton better. I recommend that they add at least a rough count/ratio of the auto to hetero component of the pico− community to this proposed study – it can be done cheaply and easily using basic and well−established staining/counting procedures using epifluorescence thereby not taxing their proposed budget too much. **Second, I just don't 'buy' that Corbula (equated with benthic grazing) is 'bad' (Fig. 3). This includes reasons listed by the authors (p. 7−8), but also, while introduced species are of course rarely 'good', the fact remains that the authors do not cite what the total benthic grazing component was before Corbula was introduced, though I admit I haven't read all the literature on this specific species to know the details of its impact. Did this clam replace another benthic suspension feeder's niche thereby resulting in equivalent grazing pressure (i.e. benthic/pelagic coupling) or has the total grazing pressure altered since Corbula became a significant player in the Bay fauna? There are many examples nation−wide where increased benthic/pelagic coupling actually results in 'good' or 'better' phytoplankton communities because clams, oysters etc. remove phytoplankton that may otherwise proliferate and become noxious or harmful.** **I think the information that can be gained from this study will be quite useful for assessing the health of the Suisan Bay and has implications for further management−related studies that are beyond the scope of the proposed study. As this study is not focused on generating new methodology or approaches because it uses well−established approaches, I find it unlikely that novel approaches will arise from this study – but that doesn't seem to be their goal anyway.**
Rating	

	Above Average

Background

Comments	**The conceptual model is clearly stated. With the exception of the benthic grazing (see above), which I am not sold on, it does explain the underlying basis for the proposed work. Documentation is fine.**
Rating	**Above Average**

Approach

Comments	**It is clear who will be performing various tasks. There are clear management implications, but I don't see much of a plan for effective dissemination of the information gained from the project beyond the usual (conferences, student support, reports to Calfed, etc.). For products of value, etc., see comments above.**
Rating	**Above Average**

Feasibility

Comments	**Yes, this is technically feasible. I think they should make a few additions for other phytoplankton size-fractions (see section 1), but the proposed laboratories are well-equipped with basic equipment for conducting the work, and I think they'll succeed. The scale of the project is within the objectives and grasp of the authors.**
Rating	**Above Average**

Budget

Comments	**There is quite a lot of paycheck collecting proposed here (except for the student, who is receiving next to nothing…); I think that the salaries for senior staff can be capped, particularly for Dugdale and Wilkerson. Does**

	the fellowship for Dr. Parker (which presumably provides extra support) expire during the study? If not, why would he need extra salary? If his fellowship does expire, leaving him scrounging for a paycheck, then of course I have no issue. Proposed budgets for boat time, supplies, travel etc. are fine.
Rating	Sufficient

Relevance To CALFED

Comments	This proposal addresses the priorities stated in the PSP and will be of obvious use to managers/policy makers. The modeling is a bit hazy, but since the data are required first, that will probably come through as the data surfaces.
Rating	Above Average

Qualifications

Comments	The PI and co-PI s (Wilkerson, Carpenter, etc.) are all very well known in their field and have made excellent contributions to science. Their qualifications are outstanding. Their labs support the necessary infrastructure to complete the tasks.
Rating	Superior

Overall Evaluation Summary Rating

Comments	I think that the proposal is quite good, and there is a clear need to understand the mechanisms guiding production in the bays proposed here (particularly Suisun). The proposed field surveys and mesocosm/dilution studies are appropriate methods that could address their question – do pp growth rates signal 'bad' habitat conditions in Suisun Bay thereby driving the POD? I think they should have considered the pico- and bacteria communities better than they have (see above) and as stated above, I'm not sure I

	believe the clam hypothesis. While the authors did not mention it, I hope that along with their size−fractionated Chl studies (flow−cytometry etc.) they will look at the dinoflagellate component as well as diatoms, as the proposal is centered on diatoms nearly exclusively. The authors are all leaders in their field and I have no qualms about their qualifications, but I do think they're asking for too much salary. In general, I'd say this proposal is a very good candidate for funding, but with the caveats stated above.
Rating	**Above Average**

External Technical Review #3

Proposal Title: Do Low Phytoplankton Growth Rates Signal the “Bad” Habitat Conditions in Susiun Bay Driving the Pelagic Organism Decline

Proposal Number: 0065

Proposal Applicant: San Francisco State University

Purpose

Comments	**The authors propose to look at the water properties and ecosystem health of Suisun Bay relative to the upstream and downstream characteristics. The authors suggest that elevated NH4 in the Bay may be responsible for the "bad" conditions and propose enclosure and dillution experiments to investigate these conditions.**
Rating	**Above Average**

Background

Comments	**The authors present a simple conceptual model for the "bad" conditions in Suisun Bay. Three possible factors are given, increaded levels of NH4, unidentified "bad" factors and benthic grazing, which lead to differences between Suisun Bay and the upstream Delta and downstream Central Bay. Phytoplankton physiology is proposed as the key expression for the system. The authors propose a series of manipulations to check the health of the phytoplankton. The background work for this effort is clearly documented. However, no work is proposed to identify the bad factors. No discussion of natural dilution experments with increased river flow in 2005 are mentioned.**
Rating	**Sufficient**

Approach

Comments	**The proposed work will clearly support the objective of describing the physiological condition of phytoplankton in Suisun Bay relative to upstream and downstream. The authors imply that dilution experiments will be useful as a possible management tool, but fail to show that NH4 has a primarily anthropogenic source in the Bay nor present any plan to test this hypothesis. The information gained will be useful in describing the conditions of the Bay ecosystem and add to the database of observations.**
Rating	**Sufficient**

Feasibility

Comments	**The proposed work is well documented and the work can be performed. The problem lies with the limited approach to the larger problem rather than the actual proposed work. Task 5 is problematic. Since only NH4 is monitored, then only dilution of NH4 can be modeled.**
Rating	**Above Average**

Budget

Comments	**The work can be completed within the budget and each aspect, except Task 5, is clearly defined.**
Rating	**Above Average**

Relevance To CALFED

Comments	**The work will give a good description of the physiological health of the phytoplankton in the Bay. It will clearly add to the information about habitat availability and response to change in Suisun Bay which is an identified priority. The project adds important information to the existing database. Whether it is ultimately useful for resource**

	management is unclear, since the project takes a very limited approach to a large problem.
Rating	**Above Average**

Qualifications

Comments	**The authors have perform similar work with success and are leaders in the field for this type of research**
Rating	**Superior**

Overall Evaluation Summary Rating

Comments	**The project proposes to investigate the "bad" conditions in Suisun Bay relative to the upstream and downstream continuum. The approach focuses on plankton physiological condition. The approach will document the variations associated with NH4 conditions. The problem with this project lies in its inability to address key issues. If there are unidentified "bad" conditions other than NH4, then no information is collected nor alternatives proposed. High NH4 levels in Suisun Bay are observed with the assumption that the source is anthropogenic and confined to the Bay, but this hypothesis is not really tested. The project will provide interesting observations, but is not sufficient to solve the problem of what is happening in the Bay.**
Rating	**Sufficient**